(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization

International Bureau



(43) International Publication Date 9 June 2005 (09.06.2005)

PCT

(10) International Publication Number WO 2005/052978 A2

(51) International Patent Classification7: H01J 37/00

(21) International Application Number:

PCT/JP2004/017969

(22) International Filing Date:

25 November 2004 (25.11.2004)

23 April 2004 (23.04.2004)

(25) Filing Language:

2004-128824

English

(26) Publication Language:

English

JP

(30) Priority Data: 2003-394655 25 November 2003 (25.11.2003) JP 2003-394653 25 November 2003 (25.11.2003) JP 2004-128856 23 April 2004 (23.04.2004) ΙP

(71) Applicant (for all designated States except US): MAT-SUSHITA ELECTRIC WORKS, LTD. [JP/JP]; 1048, Oaza-Kadoma, Kadoma-shi, Osaka 571-8686 (JP).

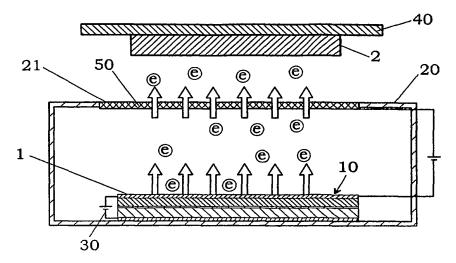
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): AlZAWA, Koichi

[JP/JP]; c/o Matsushita Electric Works, Ltd., 1048, Oaza-Kadoma, Kadoma-shi, Osaka 571-8686 (JР). ICHI-HARA, Tsutomu [JP/JP]; c/o Matsushita Electric Works, Ltd., 1048, Oaza-Kadoma, Kadoma-shi, Osaka 571-8686 (JP). KOMODA, Takuya [JP/JP]; c/o Matsushita Electric Works, Ltd., 1048, Oaza-Kadoma, Kadoma-shi, Osaka 571-8686 (JP). IKEDA, Jyunji [JP/JP]; c/o Matsushita Electric Works, Ltd., 1048, Oaza-Kadoma, Kadoma-shi, Osaka 571-8686 (JP). BABA, Toru [JP/JP]; c/o Matsushita Electric Works, Ltd., 1048, Oaza-Kadoma, Kadoma-shi, Osaka 571-8686 (JP).

- (74) Agents: NISHIKAWA, Yoshikiyo et al.; Hokuto Patent Attorneys Office, Umeda-Daiichiseimei Bldg. 5th Floor, 12-17, Umeda 1-chome, Kita-ku, Osaka-shi, Osaka 530-0001 (JP).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH,

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR MODIFYING OBJECT WITH ELECTRONS GENERATED FROM COLD CATHODE ELECTRON EMITTER



(57) Abstract: Apparatus and method for modifying an object with electrons are provided, by which the object can be uniformly and efficiently modified with the electrons under a pressure substantially equal to atmospheric pressure even when having a relatively wide surface area to be treated. This method uses a cold-cathode electron emitter having the capability of emitting electrons from a planar electron emitting portion according to tunnel effect, and preferably comprising a pair of electrodes, and a strong field drift layer including nanocrystalline silicon disposed between the electrodes. The object is exposed to electrons emitted from the planar electron emitting portion by applying a voltage between the electrodes. It is preferred that an energy of the emitted electrons is selected from a range of 1 eV to 50 keV, and preferably 1 eV to 100 eV.

2005/052978 A2 |||||

WO 2005/052978 A2

PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW. GII, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LU, MC, NL, PL, PT, RO, SE,

SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

 without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.